

What is claimed:

1. A motor vehicle steering column and seat belts with a protective device, comprising  
a pair of bearing boxes, each of which is rigidly attached to a torque box and in the rear  
5 portion of a deformable longitudinal runner, facing a passenger compartment and having  
the greatest stiffness;

at least one pair of independently operating piston devices, each of which, arranged in the  
front section of a vehicle body, consists of a piston head, located in the vicinity of a  
front bumper, a guide-wire member, connected to a deformable element, attached to the  
10 passenger compartment, and a piston rod, which, guided by the bearing box, is movable  
in the longitudinal runner, where the piston head and the guide-wire member are  
fastened to the front and rear portion of the piston rod;

a seat-belt wire, wound about pivots, attached to the torque box and a pair of side rails,  
and pivots of both guide-wire members, where both ends of the seat-belt wire are  
15 connected to at least one pair of energy-absorbing, vibration-dampening delimiters,  
fastened to stiff vehicle members, with sites of predetermined fracture in connection  
with the seat belts;

two steering-column wires, each of which, provided with a wire holder and at least one  
energy-absorbing steering-column delimiter with at least one site of predetermined  
20 fracture, is connected to the guide-wire member and wound about pivots, and

a collapsible casing, arranged between a collapsible upper portion of the steering column  
with a steering wheel and a non-collapsible lower portion thereof, attached to a dash  
panel, where the collapsible upper portion thereof has a threaded stud, which,  
accommodating both wire holders, has a threaded end projection onto which a nut is  
25 screwed to secure them;

whereby in the event of a front collision impact energy displaces the front bumper and at least one piston head, which deforms the respective longitudinal runner, loosely guided by the respective piston rod, and deflects the respective guide-wire member, whose movement results in

5 energy absorption and vibration-dampening in association with deforming the longitudinal runner, the deformable element and the delimiters of the seat belts and collapsing the collapsible upper portion of the steering column with the steering wheel; release of the respective steering-column wire and pre-tensioning the seat belts of belted passengers up to a predetermined length of seat-belt  
10 retraction.

2. A motor vehicle steering column and seat belts with a protective device, comprising at least one pair of independently operating piston devices, each of which, arranged in the front section of a vehicle body, has a piston rod, which, arranged to a longitudinal runner, has a front portion, fastened to the front portion of the longitudinal runner, a  
15 mid-portion, loosely guided by a bearing of a dash panel, reinforced, and a rear portion, to which a guide-wire member is fastened, where the bearing is provided with a soundproofing bush;

a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and pivots of both guide-wire members, where both ends of the seat-belt wire are connected  
20 to at least one pair of energy-absorbing, vibration-dampening delimiters, fastened to stiff vehicle members, with sites of predetermined fracture in connection with the seat belts; two steering-column wires, each of which, provided with a wire holder and at least one energy-absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the guide-wire member and wound about pivots, and

a collapsible casing, arranged between a collapsible upper portion of the steering column with a steering wheel and a non-collapsible lower portion thereof, attached to the dash panel and the torque box, where the collapsible upper portion thereof has a threaded stud, which, accommodating both wire holders, has a threaded end projection onto  
5 which a nut is screwed to secure them;

whereby in the event of a mid-front collision impact energy displaces the front bumper and both piston heads, which deform both longitudinal runners and deflect both guide-wire members, whose movement results in

energy absorption and vibration-dampening in association with deforming the longitudinal  
10 runners and the delimiters of the seat belts and collapsing the collapsible upper portion of the steering column with the steering wheel;

release of both steering-column wires and

pre-tensioning the seat belts of belted passengers up to a predetermined length of seat-belt retraction.

15 3. A motor vehicle steering column and seat belts with a protective device, comprising at least one pair of independently operating piston devices, each of which, arranged in the front section of a vehicle body, has a piston rod, which, arranged to a longitudinal runner, has a front portion, fastened to the front portion of the longitudinal runner, a mid-portion, loosely guided by a soundproofing bearing of a dash panel, reinforced, and  
20 a rear portion, to which a guide-wire member is fastened,

a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and pivots of both guide-wire members, where both ends of the seat-belt wire are connected to at least one pair of energy-absorbing, vibration-dampening delimiters, fastened to stiff vehicle members, with sites of predetermined fracture in connection with the seat belts;

two steering-column wires, each of which, provided with a wire holder and at least one energy-absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the guide-wire member and wound about pivots, and a collapsible casing, arranged between a collapsible upper portion of the steering column with a steering wheel and a non-collapsible lower portion thereof, attached to the dash panel and the torque box, where the collapsible upper portion thereof has a threaded stud, which, accommodating both wire holders, has a threaded end projection onto which a nut is screwed to secure them;

whereby in the event of a front collision impact energy displaces the front bumper and the corresponding piston head, which deforms the respective longitudinal runner and deflects the respective guide-wire member, whose movement results in energy absorption and vibration-dampening in association with deforming the longitudinal runner and the delimiters of the seat belts and collapsing the collapsible upper portion of the steering column with the steering wheel;

release of the respective steering-column wire and pre-tensioning the seat belts of belted passengers up to a predetermined length of seat-belt retraction.

4. A motor vehicle steering column and seat belts equipped with an energy-absorbing protective device according to claim 1, further comprising

a cone-shaped hub, which, facing the longitudinal runner, is provided for each piston head, whereby in the event of a front collision at least one piston head deforms the deformable longitudinal runner, the guide-wire member deforms the deformable element and the respective hub reams the longitudinal runner during which the piston rod, guided by the respective bearing box and the hub, loosely guides the longitudinal runner thereby

preventing buckling and

achieving the highest efficiency of the energy absorption of the longitudinal runner.

5. A motor vehicle steering column and seat belts according to claim 4, wherein the delimiter of the seat belts consists of a spring, shock absorber and delimiting unit, comprising a support member with a plate, biased by a spring, and a tube, which, movable in the support member and provided with a notch, at least one site of predetermined fracture and a number of adjusting holes, is moved by tension force of the seat-belt wire until the biased plate snaps into the notch to block further movement and limit the retraction-length of all the seat belts, where upon great tension force the site of predetermined fracture is fractured and the seat-belt wire is released.

6. A motor vehicle steering column and seat belts equipped with an energy-absorbing protective device according to claim 3, further comprising a guide assembly, a retaining assembly and a blocking assembly, each assembly consists of a guide member and a mating longitudinally guided member, of a key and a mating receptacle and of a contacted member and a mating blocking member, all three members and all three mating members are provided for a retaining member and a mating clamping member of the delimiter of the seat belts, where the clamping member is provided with at least one site of predetermined fracture and with a number of adjusting holes and a pre-wire of the seat belts and the seat-belt wire are connected to a free rear and free front portion;

whereby in the event of a front collision the seat-belt wire, loaded, pulls the clamping member, movement of which, guided by the guide member, along the retaining member, fastened to a stiff motor vehicle member, results in engagement of the key with the receptacle and in contact of the contacted member with the blocking member thereby

dissipating energy, dampening vibration and releasing the seat-belt wire in association with work of deformation, friction and fracture of the site of predetermined fracture and

preserving the clamping force of the clamping member and lengths of all the retracted seat belts.

7. A motor vehicle steering column and seat belts according to claim 6, wherein a longitudinal gap serves as the longitudinally guided member of the clamping member, which, pre-loaded, arranged on the retaining member with a longitudinal strut, serving as the guide member.

8. A motor vehicle steering column and seat belts according to claim 7, wherein the contact area of the portion of the retaining member is surrounded by a soundproofing material.

9. A motor vehicle steering column and seat belts according to claim 8, wherein a pair of retaining apertures on the longitudinal gap of the clamping member serves as the receptacle and a two-side retaining strut on the longitudinal strut of the retaining member serves as the key.

10. A motor vehicle steering column and seat belts according to claim 9, wherein a blocking pin, serving as the blocking member, is projected through the rear portion of the clamping member and a fork-shaped wire holder of the pre-wire of the seat belts, and both end projections are secured by securing parts and a surface of the retaining member, facing the blocking pin, serves as the contacted member, where the blocking assembly with a clearance of  $(s_2)$  and the retaining assembly with a clearance of  $(s_1)$ , which is bigger than  $(s_2)$ , are in engagement thereby facilitating a blocking operation while maintaining the retaining condition upon further movement of the clamping member under load of great impact energy to release the seat-belt wire in association with fracturing the site of predetermined fracture and to preserve the clamping force of the clamping member and the predetermined length of the seat-belt retraction.

11. A motor vehicle steering column and seat belts according to claim 10, wherein the clamping member, when moving along the retaining member, expands.

12. A motor vehicle steering column and seat belts according to claim 11, wherein the portion of the clamping member and of the retaining member, which are in contact, are  
5 defined by the same conical form.

13. A motor vehicle steering column and seat belts according to claim 6, wherein a longitudinal gap serves as the longitudinally guided member of the clamping member, which, pre-loaded, arranged in the retaining member with a guide pin, serving as the guide member.

14. A motor vehicle steering column and seat belts according to claim 13, wherein the  
10 contact area of the portion of the clamping member is surrounded by a soundproofing material.

15. A motor vehicle steering column and seat belts according to claim 14, wherein a retaining collar on the rear end of the clamping member serves as the key and the retaining member is provided with a retaining notch, serving as the receptacle, and with a cone-shaped  
15 chamfer at the end portion to assist the process of engagement of the retaining collar with the retaining notch.

16. A motor vehicle steering column and seat belts according to claim 15, wherein a pair of open notches of the retaining member serves as the contacted member to receive a pair of guide sleeves of a blocking pin, where the blocking pin, projected through the rear portion of  
20 the clamping member, a wire holder of the pre-wire of the seat belts, and the pair of guide sleeves, serving as the blocking member, on the clamping member, has end projections, secured by securing parts, where the blocking assembly and the retaining assembly with a clearance of ( $s_3$ ) are in engagement thereby facilitating a blocking operation

while maintaining the state of retaining upon further movement of the clamping member under load of great impact energy,

to release the seat-belt wire in association with fracturing the site of predetermined fracture and

5 to preserve the clamping force of the clamping member and the predetermined length of the seat-belt retraction.

17. A motor vehicle steering column and seat belts according to claim 16, wherein the clamping member, when moving along the retaining member, contracts.

18. A motor vehicle steering column and seat belts according to claim 17, wherein the  
10 portion of the clamping member and of the retaining member, which are in contact, are defined by the same conical form.

19. A motor vehicle steering column and seat belts according to claim 2, wherein a number of adjusting holes is distributed along the rear portion of the piston rod.

20. A motor vehicle steering column and seat belts according to claim 19, wherein the  
15 guide-wire member has a longitudinal hole to accommodate the rear portion of the piston rod, to which the guide-wire member and the wire holder of the steering-column wire are fastened by a fastener, and a web with a transverse hole, serving as the pivot of the seat-belt wire.

21. A motor vehicle steering column and seat belts according to claim 3, wherein a number  
20 of adjusting holes is distributed along the front portion and the rear portion of the piston rod.

22. A motor vehicle steering column and seat belts according to claim 21, wherein the steering-column delimiter comprises of a support plate with an aperture, a tube with at least one site of predetermined fracture and with a number of adjusting holes and a blocking member, which, projected through a transverse hole of the rear portion of the tube, has end



projections, secured thereon by securing parts, where the fracture occurs when the deflection of the delimiter exceeds the distance between the blocking member, bigger than the aperture of the support plate, and the support plate, fixed to a stiff motor vehicle member.

23. A motor vehicle steering column and seat belts according to claim 22, wherein the rear  
5 portion of the piston rod is fastened to a longitudinal hole of the guide-wire member, which has a web with a transverse hole, serving as the pivot of the seat-belt wire, and another longitudinal hole to accommodate the steering-column delimiter, an appropriate adjusting hole of which is occupied by the wire holder of the steering-column wire.

24. A motor vehicle steering column and seat belts according to claim 3, wherein the  
10 delimiters of the seat belts and steering column are plates, where a mid-portion of each plate is provided with at least one site of predetermined fracture, a front portion has a number of adjusting holes, one of which is occupied by a first delimiter-wire, and a rear portion has a number of adjusting holes, one of which is occupied by a second delimiter-wire.

25. A motor vehicle steering column and seat belts according to claim 24, wherein the first  
15 delimiter-wire is movable with the guide-wire member and the second delimiter-wire, inserted into a hole of a stiff holder, fastened to a stiff motor vehicle member, has a blocking member, the distance between which and the hole thereof is adjusted by clamping a spacer with open profile and an appropriate length onto the second delimiter-wire.

26. A motor vehicle steering column and seat belts with a protective device, comprising  
20 a pair of bearing boxes, each of which is rigidly attached to a torque box and in the front portion of a deformable longitudinal runner, facing a passenger compartment and having the greatest stiffness;

at least one pair of independently operating piston devices, each of which, arranged in the rear section of a vehicle body, consists of a piston head, located in the vicinity of a rear

bumper, a guide-wire member, connected to a deformable element, attached to the passenger compartment, and a piston rod, which, guided by the bearing box, is movable in the longitudinal runner, where the piston head and the guide-wire member are fastened to the rear and front portion of the piston rod;

5 a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and pivots of both guide-wire members, where both ends of the seat-belt wire are connected to at least one pair of energy-absorbing, vibration-dampening delimiters, fastened to stiff vehicle members, with sites of predetermined fracture in connection with the seat belts;

10 two steering-column wires, each of which, provided with a wire holder and at least one energy-absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the guide-wire member and wound about pivots, and

a collapsible casing, arranged between a collapsible upper portion of the steering column with a steering wheel and a non-collapsible lower portion thereof, attached to a dash panel, where the collapsible upper portion thereof has a threaded stud, which,  
15 accommodating both wire holders, has a threaded end projection onto which a nut is screwed to secure them;

whereby in the event of a rear collision impact energy displaces the rear bumper and at least one piston head, which deforms the respective longitudinal runner, loosely guided by the respective piston rod, and deflects the respective guide-wire member, whose movement  
20 results in

energy absorption and vibration-dampening in association with deforming the longitudinal runner, the deformable element and the delimiters of the seat belts and collapsing the collapsible upper portion of the steering column with the steering wheel;  
release of the respective steering-column wire and

pre-tensioning the seat belts of belted passengers up to a predetermined length of seat-belt retraction.

27. A motor vehicle steering column and seat belts with a protective device, comprising

at least one pair of independently operating piston devices, each of which, arranged in the

5 rear section of a vehicle body, has a piston rod, which, arranged to a longitudinal runner, has a rear portion, fastened to the rear portion of the longitudinal runner, a mid-portion, loosely guided by a bearing of a rear panel of a passenger compartment, reinforced, and a front portion, to which a guide-wire member is fastened, where the bearing is provided with a soundproofing bush;

10 a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and pivots of both guide-wire members, where both ends of the seat-belt wire are connected to at least one pair of energy-absorbing, vibration-dampening delimiters, fastened to stiff vehicle members, with sites of predetermined fracture in connection with the seat belts;

two steering-column wires, each of which, provided with a wire holder and at least one

15 energy-absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the guide-wire member and wound about pivots, and

a collapsible casing, arranged between a collapsible upper portion of the steering column

with a steering wheel and a non-collapsible lower portion thereof, attached to a dash

panel and the torque box. where the collapsible upper portion thereof has a threaded

20 stud, which, accommodating both wire holders, has a threaded end projection onto

which a nut is screwed to secure them;

whereby in the event of a mid-rear collision impact energy displaces the rear bumper and

both piston heads, which deform both longitudinal runners and deflect both guide-wire

members, whose movement results in

energy absorption and vibration-dampening in association with deforming the longitudinal runners and the delimiters of the seat belts and collapsing the collapsible upper portion of the steering column with the steering wheel;

release of both steering-column wires and

5 pre-tensioning the seat belts of belted passengers up to a predetermined length of seat-belt retraction.

28. A motor vehicle steering column and seat belts with a protective device, comprising at least one pair of independently operating piston devices, each of which, arranged in the rear section of a vehicle body, has a piston rod, which, arranged to a longitudinal runner, 10 has a rear portion, fastened to the rear portion of the longitudinal runner, a mid-portion, loosely guided by a soundproofing bearing of a rear panel of a passenger compartment, reinforced, and a front portion, to which a guide-wire member is fastened, a seat-belt wire, wound about pivots, attached to a torque box and a pair of side rails, and pivots of both guide-wire members, where both ends of the seat-belt wire are connected 15 to at least one pair of energy-absorbing, vibration-dampening delimiters, fastened to stiff vehicle members, with sites of predetermined fracture in connection with the seat belts; two steering-column wires, each of which, provided with a wire holder and at least one energy-absorbing steering-column delimiter with at least one site of predetermined fracture, is connected to the guide-wire member and wound about pivots, and 20 a collapsible casing, arranged between a collapsible upper portion of the steering column with a steering wheel and a non-collapsible lower portion thereof, attached to a dash panel and the torque box. where the collapsible upper portion thereof has a threaded stud, which, accommodating both wire holders, has a threaded end projection onto which a nut is screwed to secure them;

whereby in the event of a rear collision impact energy displaces the rear bumper and the corresponding piston head, which deforms the respective longitudinal runner and deflects the respective guide-wire member, whose movement results in

energy absorption and vibration-dampening in association with deforming the longitudinal

5 runner and the delimiters of the seat belts and collapsing the collapsible upper portion of the steering column with the steering wheel;

release of the respective steering-column wire and

pre-tensioning the seat belts of belted passengers up to a predetermined length of seat-belt retraction.

10 29. A motor vehicle steering column and seat belts equipped with an energy-absorbing protective device according to claim 26, further comprising

a cone-shaped hub, which, facing the longitudinal runner, is provided for each piston head, whereby in the event of a rear collision at least one piston head deforms the deformable longitudinal runner, the guide-wire member deforms the deformable element and the

15 respective hub reams the longitudinal runner during which the piston rod, guided by the respective bearing box and the hub, loosely guides the longitudinal runner thereby preventing buckling and

achieving the highest efficiency of the energy absorption of the longitudinal runner.

30. A motor vehicle steering column and seat belts according to claim 29, wherein the  
20 delimiter of the seat belts consists of a spring, shock absorber and delimiting unit, comprising a support member with a plate, biased by a spring, and a tube, which, movable in the support member and provided with a notch, with at least one site of predetermined fracture and a number of adjusting holes, is moved by tension force of the seat-belt wire until the biased plate snaps into the notch to block further movement and limit the retraction-length of all the

seat belts, where upon great tension force the site of predetermined fracture is fractured and the seat-belt wire is released.

31. A motor vehicle steering column and seat belts equipped with an energy-absorbing protective device according to claim 28, further comprising

5 a guide assembly, a retaining assembly and a blocking assembly, each assembly consists of a guide member and a mating longitudinally guided member, of a key and a mating receptacle and of a contacted member and a mating blocking member, all three members and all three mating members are provided for a retaining member and a mating clamping member of the delimiter of the seat belts, where the clamping member is  
10 provided with at least one site of predetermined fracture and with a number of adjusting holes and a pre-wire of the seat belts and the seat-belt wire are connected to a free rear and free front portion;

whereby in the event of a rear collision the seat-belt wire, loaded, pulls the clamping member, movement of which, guided by the guide member, along the retaining member, fastened to a  
15 stiff motor vehicle member, results in engagement of the key with the receptacle and in contact of the contacted member with the blocking member thereby

dissipating energy, dampening vibration and releasing the seat-belt wire in association with work of deformation, friction and fracture of the site of predetermined fracture and preserving the clamping force of the clamping member and lengths of all the retracted seat  
20 belts.